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EXAMINER

UMEZ ERONINI, LYNETTE T

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| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 04/18/2002 4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/665,940

Applicant(s)

KOSHIMIZU ET AL.

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 12-22 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 12-22 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 12-20 in Paper No. 5 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (US 5,529,657) in view of Hatano et al. (US 5,709,757) Komino et al. (US 5,769,952) and Hasegawa et al. (US 5,271,788).

Ishii teaches a plasma processing method. The method comprises:

"a semiconductor wafer (same as applicant's workpiece) W, is loaded into the chamber (same as applicant's plasma processing chamber) 2 and placed on the electrostatic chuck sheet 4 by a convey arm (not shown)" (column 6, lines 18-20). "The electrostatic chuck sheet 4 is constituted by covering a conductive film 41 serving as an electrostatic chuck sheet electrode . . . The conductive film 41 is electrically connected to a DC power supply 43 . . ." (column 4, lines 7-15), hence, the aforementioned reads on,

a step in which a workpiece is placed at a mounting surface of an electrode provided inside a plasma processing chamber.

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"The interior of the chamber **2** is evacuated . . . to a predetermined vacuum atmosphere . . . while supplying an etching gas, . . . into the chamber **2** . . . in order to maintain the interior of the chamber to a vacuum degree of, e.g. several mTorr to several tens mTorr" (column 6, lines 20-28), reads on,

a step in which plasma processing is performed on said workpiece under reduced pressure atmosphere.

"The first gate valve **95** is opened, and the convey arm **97** is extended to convey wafer **W** to above the rest table in the processing chamber **2**" (column 9, lines 42-44 and Figure 11), which reads on,

a step in which a means for opening/closing that switchably connect a delivery chamber engaged in transfer of said workpiece with said plasma process chamber from/to said plasma processing chamber.

Ishii differs in failing to teach a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode.

Hatano teaches "A high voltage is applied to the conductive film **33** from the DC voltage source, so that the object **W** is attracted and held by coulomb force on the upper surface of the insulating film **31** of the electrostatic chuck" (column 7, lines 13-16), which reads on, a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by using Hatano's method to hold a workpiece by

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applying a high level DC voltage to an electrostatic chuck for the purpose of uniformly holding a wafer without the need for any mechanical clamps.

Ishii differs in failing to teach a step in which said electrode is moved from an upper plasma processing position to a lower delivery position after said plasma processing ends.

Komino teaches, "After completion of etching, . . . The susceptor is at the lowered position during wafer **W** transfer, but at the raised position near the gas emission means (upper electrode) **306** during plasma etching" (column 14, lines 12-19), which reads on a step in which said electrode is moved from an upper plasma processing position to a lower delivery position after said plasma processing ends.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by using Komino's method of moving the electrode from an upper plasma processing position to a lower delivery position after said plasma processing ends for the purpose of easily transporting a processed wafer.

Ishii differs in failing to teach inducing a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing chamber before said electrode reaches said delivery position.

Hasegawa teaches " . . . an inactive gas (e.g., nitrogen) and an exhaust pipe **6** connected to a vacuum pump, are connected to each of the load lock chambers **2**, an inner atmosphere of the chamber **2** can be changed to a high reduced pressure

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atmosphere and an inactive gas atmosphere, independently of the process chamber 1 (column 4, lines 26-32). Using Hasegawa's method of supplying nitrogen to a load lock chamber, which is the same as applicant's step to induce a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing chamber before said electrode reaches said delivery position.

Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by inducing a gas inside a delivery chamber as taught by Hasegawa for the purpose of removing moisture or any unwanted contaminant from the chamber.

4. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii ('657) in view of Hatano ('757), Komino ('952), and Hasegawa ('788) as applied to claim 12 above.

Ishii differs in failing to teach a step in which a high DC voltage with a reverse polarity from the polarity of said high level DC voltage, **as in claim 13**.

It is well known that power supply provides both negative and positive bias, which may be used to reverse the polarity as desired.

Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to employ a step in which a high DC voltage with a reverse polarity from the polarity of said high level DC voltage for the purpose of removing both negative and positively charged particles from an electrostatic chuck.

Ishii differs in failing to teach before said means for opening/closing is opened, the atmosphere inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supplied system, **as in claim 14**.

Hasegawa teaches " . . . an inactive gas (e.g., nitrogen) and an exhaust pipe 6 connected to a vacuum pump, are connected to each of the load lock chambers 2, an inner atmosphere of the chamber 2 can be changed to a high reduced pressure atmosphere and an inactive gas atmosphere, independently of the process chamber 1 (column 4, lines 26-32), which reads on said delivery chamber is sustained at a higher pressure than the pressure inside said plasma processing chamber into said plasma processing chamber by an inert gas supplied from an inert gas supply system before said means for opening/closing is opened.

Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by inducing a gas inside a delivery chamber as taught by Hasegawa for the purpose of removing moisture or any unwanted contaminant from the chamber.

Ishii differs in failing to teach the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened, **in claim 15**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to set the pressure inside the delivery chamber to be roughly

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equal to the pressure inside the processing chamber as desired for the purpose of preventing harmful gases from flowing one chamber into the next chamber.

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii ('657) in view of Hatano ('757) and (Hasegawa ('788).

Ishii teaches a plasma processing method. The method comprises:

"a semiconductor wafer (same as applicant's workpiece) W, is loaded into the chamber (same as applicant's plasma processing chamber) **2** and placed on the electrostatic chuck sheet **4** by a convey arm (not shown)" (column 6, lines 18-20). "The electrostatic chuck sheet **4** is constituted by covering a conductive film **41** serving as an electrostatic chuck sheet electrode . . . The conductive film **41** is electrically connected to a DC power supply **43** . . ." (column 4, lines 7-15), hence, the aforementioned reads on,

a step in which a workpiece is placed at a mounting surface of an electrode provided inside a plasma processing chamber.

"The interior of the chamber **2** is evacuated . . . to a predetermined vacuum atmosphere . . . while supplying an etching gas, . . . into the chamber **2** . . . in order to maintain the interior of the chamber to a vacuum degree of, e.g. several mTorr to several tens mTorr" (column 6, lines 20-28), reads on,

a step in which plasma processing is performed on said workpiece under reduced pressure atmosphere.

"The first gate valve **95** is opened, and the convey arm **97** is extended to convey wafer **W** to above the rest table in the processing chamber **2**" (column 9, lines 42-44), which reads on,

a step in which a means for opening/closing that switchably connect a delivery chamber engaged in transfer of said workpiece with said plasma process chamber to/from said plasma processing chamber.

Ishii differs in failing to teach a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode.

Hatano teaches "A high voltage is applied to the conductive film **33** from the DC voltage source, so that the object **W** is attracted and held by coulomb force on the upper surface of the insulating film **31** of the electrostatic chuck" (column 7, lines 13-16), which reads on, a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by using Hatano's method to hold a workpiece by applying a high level DC voltage to an electrostatic chuck for the purpose of uniformly holding a wafer without the need for any mechanical clamps.

Ishii differs in failing to teach a step to induce a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing

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chamber into said plasma processing chamber after said plasma processing is completed.

Hasegawa teaches " . . . an inactive gas (e.g., nitrogen) and an exhaust pipe 6 connected to a vacuum pump, are connected to each of the load lock chambers 2, an inner atmosphere of the chamber 2 can be changed to a high reduced pressure atmosphere and an inactive gas atmosphere, independently of the process chamber 1 (column 4, lines 26-32). Using Hasegawa's method of supplying nitrogen to a load lock chamber which is the same as applicant's method of inducing a gas in a delivery chamber would result in inducing a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing chamber into said plasma processing chamber after said plasma processing is completed.

Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Ishii by inducing a gas inside a delivery chamber as taught by Hasegawa for the purpose of venting unwanted gases from the chamber.

6. Claims 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii ('657) in view of Hatano ('757) and Hasegawa ('788) as applied to claim 18 above.

Ishii differs in failing to teach before said means for opening/closing is opened, the atmosphere inside said delivery chamber is sustained at a higher pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supply system, **as in claim 19.**

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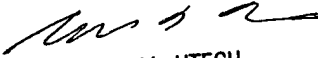
It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to pump an inert gas under high pressure into a delivery chamber at a higher pressure than the pressure inside the plasma processing chamber before a means for opening/closing is opened, as desired for the purpose of venting the delivery chamber of unwanted gases.

Ishii differs in failing to the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened, **in claim 20**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to set the pressure inside the delivery chamber to be roughly equal to the pressure inside the processing chamber as desired for the purpose of preventing harmful gases from flowing one chamber into the next chamber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner can normally be reached on First Friday.

ltue
April 16, 2002


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